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Near-infrared coronagraphic imaging of the circumstellar disk around TW Hydrae

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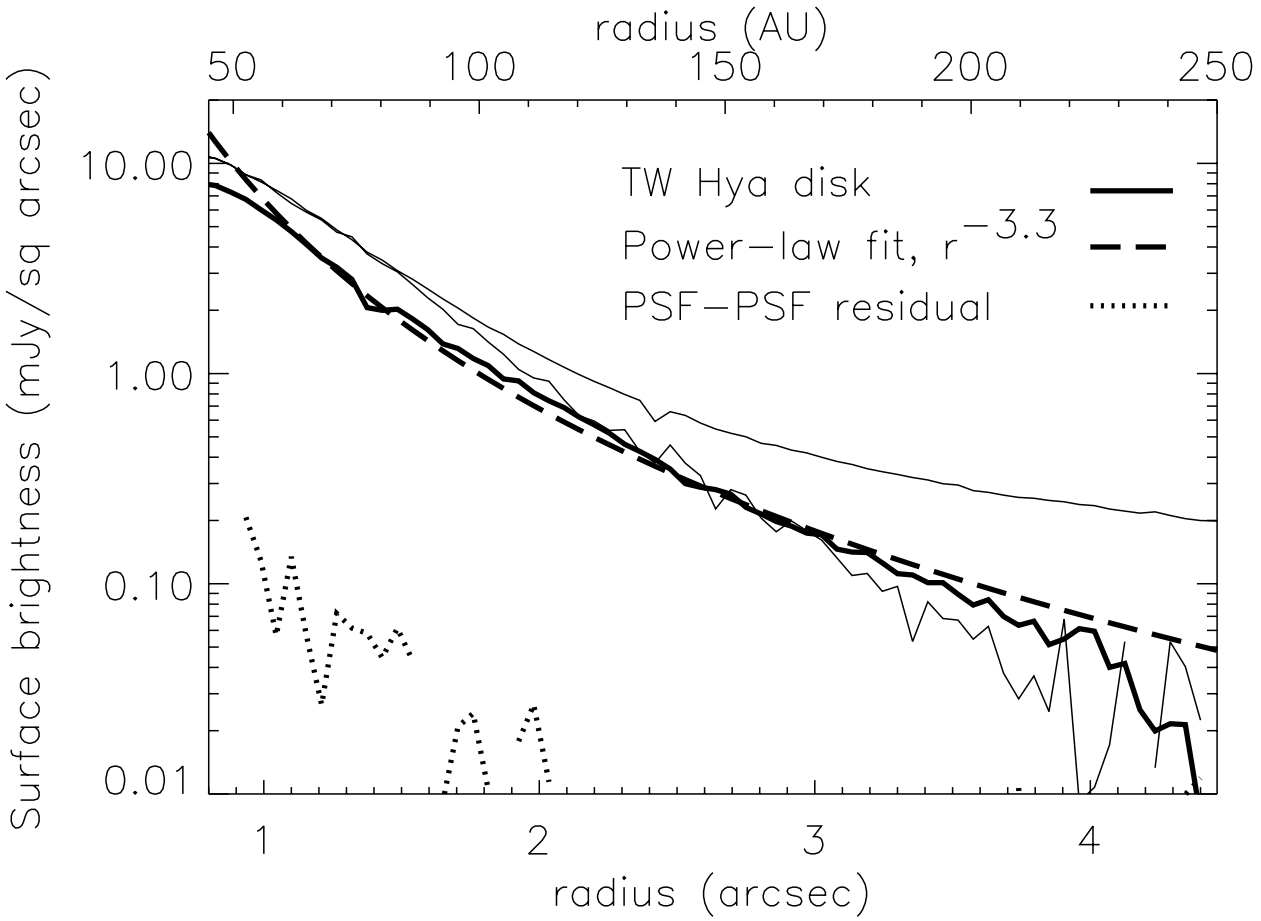
abstract We present ground-based near-infrared (H-band) imaging of the circumstellar disk around the nearby classical T Tauri star TW Hydrae. The scattered light image shows a face-on disk with radius 4 arcseconds (corresponding to 225 AU) and a morphology which agrees with recent images from the Hubble Space Telescope and the Very Large Array. The best fit power-law for the disk's radial surface brightness profile obeys the law $r^{-3.3\pm0.3}$. We use our image and published continuum flux densities to derive properties of the disk with a simple model of emission from an optically thick, flat disk. The best-fit values for disk mass and inner radius are 0.03 $M_{\odot}$ and 0.3 AU; best-fit values for temperature, density, and grain opacity power law exponents (q, p, and β) are 0.7, 1.3, and 0.9, respectively. These properties are similar to those of disks around classical T Tauri stars located in more distant molecular clouds. Because of TW Hydrae's nearby location and pole-on orientation, it is a uniquely favorable object for future studies of radial disk structure at the classical T Tauri stage.


radius (AU)
50
100
150
200
250
10.00
1.00
0.10
0.01
Surface brightness (mJy/sq arcsec)
TW Hya disk
Power−law fit, r^−3.3
PSF−PSF residual
1
2
3
4
radius (arcsec)